POPULAR MECHANICS

An Illustrated Weekly Review of the Mechanical Press of the World

"Tells you how to do things" — Written so you can understand it

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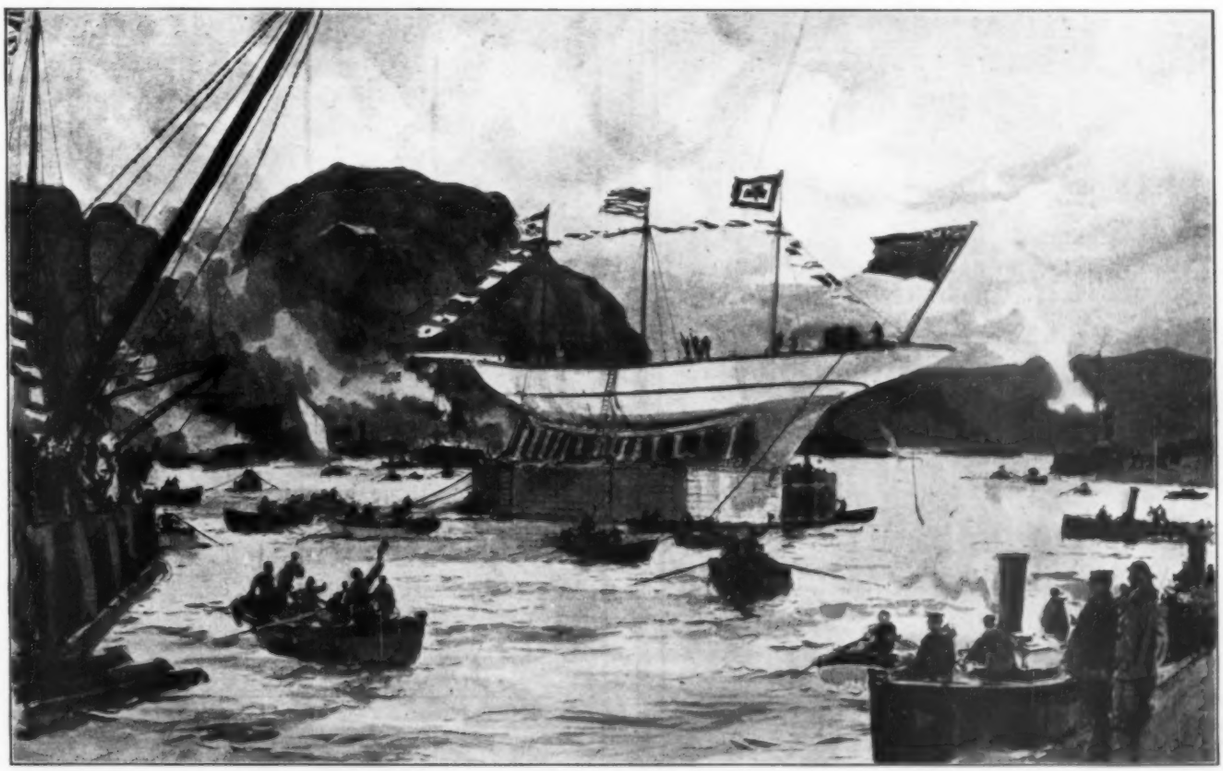
Lipton's Yacht, that England Declares Invincible



Shamrock III Afloat on Her Cradle as She Appeared at the Notable Launching at Dumbarton on the Clyde--See Page 249

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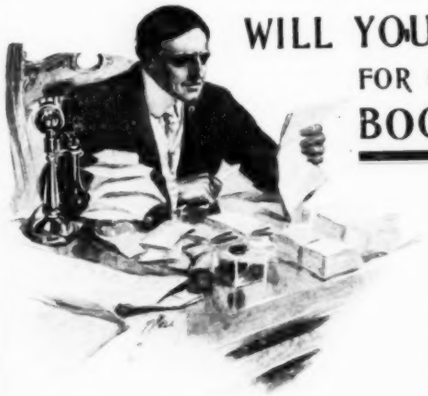
Mention Popular Mechanics.

COFFEE OF HORSE LIVERS, BOOTLEGS AND CHICORY.

Coffee of peas and beans, generally sold as Mocha and Java, as previously mentioned in Popular Mechanics, would be considered a delicacy at sea, according to the statement of Frithiof H. Buryeson, of Brooklyn. In the kind of coffee that sailors use, he declares, the American art of adulterating has reached its zenith. He avers that the sailors' coffee is an infernal compound of horse livers, old bootlegs and chicory.

"We sailors on account of its make-up," he says, "used to call it 'bootleg.'"

The first centrifugal pump is believed to have been invented about 200 years ago by a Frenchman, Denis Papin, in Hesse, Germany, where it was known as the Hessian suck.



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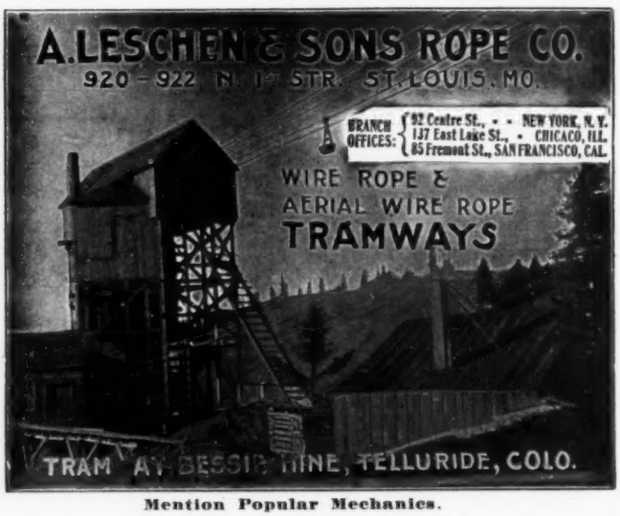
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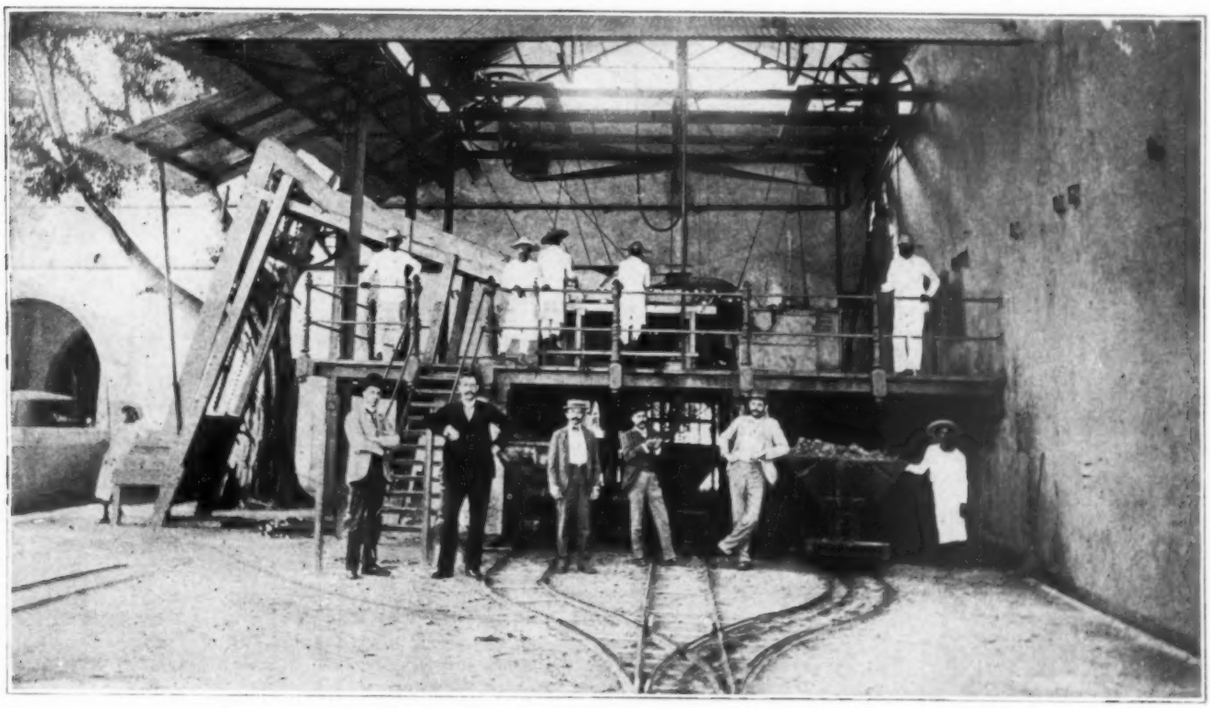
The World's Strongest Cordage and the Plant that Produces It

Fiber From Agave That Binds Sheaves of Wheat Once Used in Building Temples and Palaces in Yucatan

By E. H. Thompson, United States Consul at Progresso, Yucatan

The agave sisalensis furnishes a fiber called sisal that not only helps to knit firmer the commerce of the whole world, but binds the sheaves of wheat so that the price of bread in every land is made cheaper by its use. In the primitive forms of habitation in Yucatan the mud and wattle "nas" are bound together by these shreds of fiber-wilted leaves. They are shapely, water-tight and durable, and the native builder's only tool is a heavy sharp-edged knife. Not a spike or nail or metal of any kind enters into the building.



Modern Fiber Cleaning Machine in Yucatan, Where Fiber for Our Best Ropes and Other Cordage is Made

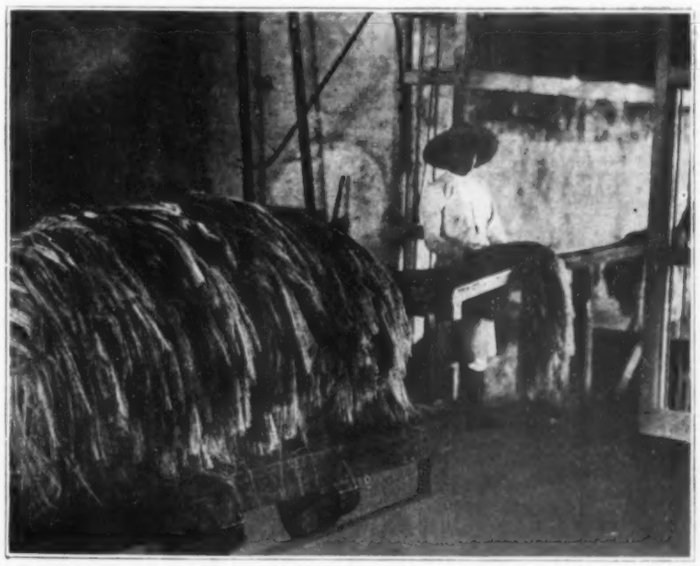
In ancient times the agave, or henequen, was one of the most important plants of the peninsula.

At a time when most of Europe was in the pall of utter darkness, when the "Parisii" lived in caves and the Gauls in "wattled huts," the priests and rulers of Yucatan lived in stone temples and palaces. Up the steep sides of the myriad pyramids were carried great blocks and sculptured columns.

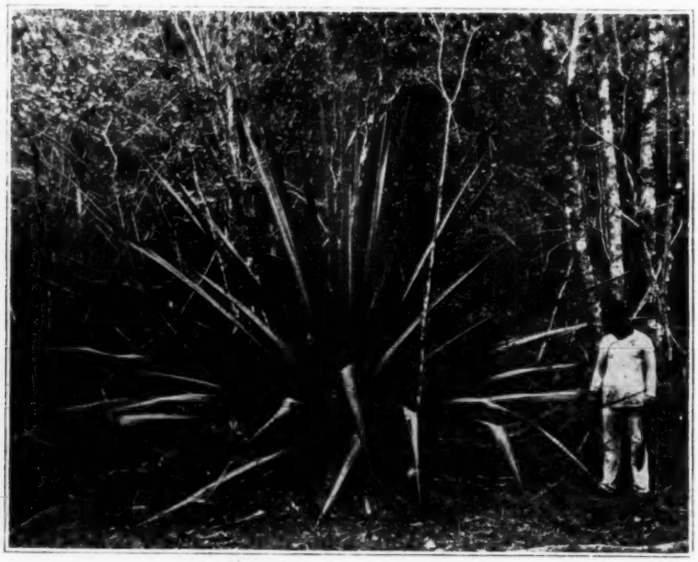
To move these mighty masses of limestone no powerful engines were at hand; but the Batabs of Yucatan, like the rulers of ancient Egypt, had little use for mechanical devices. Human muscle and ropes of agave were all-sufficient. If ten ropes and a hundred slaves were not enough, a hundred ropes and a thousand slaves were not lacking. The ancient artists made use of the fiber in their work. They were not content to make the figure; they made the skeleton, and upon the bones and in the flesh—like the cords and muscles of the body—they placed cords and plaited bands of fiber. Over the imbedded muscles and flesh they placed a thin, hard wash of stucco, to represent the skin and surface pigments. The writer has examined many dozen specimens of the broken figures of stucco wherein are plainly shown the casts and the knots and braid—even the very character of the fiber.

Ropes and cables for boats were also made of agave fiber, cleaned by the ancient methods and twisted by hand into the cordage needed.

Today half a dozen machines for cleaning the fiber are in the market, some of them marvels of design and potency. It is unquestionably true, however, that the fiber produced by the ancient implements, the pacche and the tonkas, possesses qualities not to be obtained by the machine-cleaned product. In the hammock-making districts of Yucatan the agave is cleaned by the ancient processes, and the makers of the finest



Sorting and Laying the Fiber Previous to Bailing It



Chom or Cahum, a Wild Variety of Agave Found in the Deep Forests of Yucatan

hammocks (those worth their weight in silver) will not use a fiber produced by any other method.

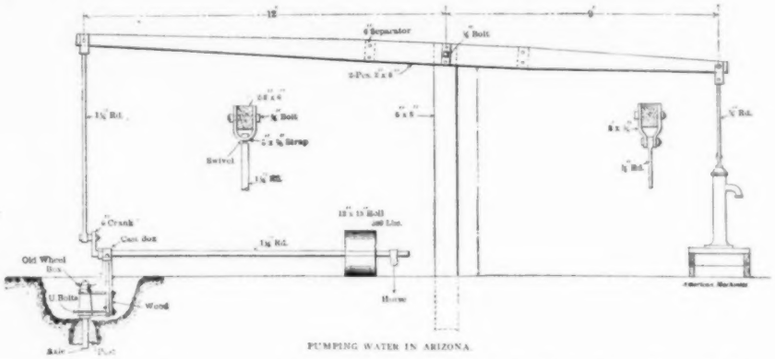
The scion when planted ("anchored" would perhaps be the better word, as it is more often held by heavy stones than by the earth around it), needs no special care or irrigation. Once or twice a season the fields are roughly weeded. The plant thrives, and generally in about five years the earlier leaves begin to extend themselves laterally at right angles to the trunk of the plant. This is nature's signal that the fiber has reached its highest point of tensile strength and that the leaves are ready to be cut. The native cutters then throng the field, and with their corbas deftly cut the leaves close to the trunk, trim off each line of side thorns at a single stroke, snip off the horny end, and bind up the leaves in bundles. Tram cars take these bundles and carry them to the cleaning machine. While experience and dexterity are required, the work is not hard or the hours long to the cutter of henequen leaves.

Portable Tramway, Used to Transport Fiber to Drying Field and Then to Bale Press

NOVEL HOME MADE IRRIGATING PUMP.

As the writer says, who describes this interesting device in the American Machinist, it may not be new, but it was to him and certainly will be to many. It is in successful operation on a farm in Salt River Valley, Arizona, where irrigation is absolutely necessary.

The principal part of this apparatus consists of a long, built-up beam, hung on a bolt at the top of a rectangular post, set firmly into the ground. The shorter arm of this beam is connected by a piece of round iron to the plunger rod of an ordinary form of lift pump, drawing water from a depth of about 25 feet. A connecting rod having a swivel connection (shown in detail) connects with the longer arm of the beam and has an eye at the lower end which connects with an adjustable crank. This crank is forged on the end of a long, round bar, on which is also made tight a 500-pound iron roller. The box for this crank shaft is a plain cast-iron box fastened to a piece of wood, which in turn is fitted and bolted to a wheel box. The wheel box rotates on the end of an old wagon axle, which is set firmly in the ground, directly under and on the center line of the connecting rod from the beam above. A horse is hitched to a ring hung on the crank shaft beyond the roller.



PUMPING WATER IN ARIZONA

It is evident that if the horse travels around a circle with the old axle as a center, the friction between the ground and the roller will cause the same and the crank to rotate; and the fact that the connecting rod is swiveled and is directly over the axle center, enables the motion to be communicated to the beam. Thus every turn of the horse makes about a dozen strokes of the pump, which would be about 100 per minute; that is, the pump is "geared up" without gears or belts. This ratio depends, of course, on the respective diameters of the circle traveled by the horse and that of the roller.

It might be asked why the two arms of the beam were not made equal and the crank correspondingly shortened to obtain the proper throw. The reason is, that it would have made the circle in which the horse traveled of too small diameter.

I think it will be admitted that, considering the simplicity and cost, the principal availed of is extremely effective, and in view of the fact that a country blacksmith shop was the best at hand, the design of the details shows some careful scheming.

America the Cleanest of All Nations

Well Equipped Laundry a Part of All First-Class Hotels, Hospitals, Flat Buildings and Many Private Homes

America, the home of the steam laundry, is the cleanest of all nations, and here has laundering reached its highest stage of development. Places considered clean and well-kept in Europe can scarcely be tolerated by the American tourist because of the miserable laundering facilities and baths. In America the increasing demand for cleanliness is causing the laundry to lose its importance as an individual establishment and to become an adjunct to other institutions. Now no first-class hotel, no hospital, asylum or sanitarium, no summer or winter resort, is complete without its private laundry. The big steamships, some railroads and many factories have laundries of their own. Big flat buildings, apartment houses, towel supply companies, and even the residences of Americans have private laundries.

Placing the Washing in the Washer

Laundering in America, through perfected machinery, has become an art as simple and facile as it is advanced. Most of the work is done by women. They do not find their task laborious, and rather like it.

The illustrations show laundry apparatus as may be found in many of the leading American homes. No longer is the washerwoman chained to the tub and washboard and condemned to a life of drudgery. The late improved Opal washer, shown in the illustration, is made by the Steel Roll Mangle Co. It is so simple that a child could manipulate it without exertion. It is operated by hand in some homes and by steam power in the more pretentious. The goods are tumbled about by the revolving cylinder forcing the water through the fabric and rubbing the clothes together so as to remove all traces of dirt. The drying closet takes all moisture from the garments in from 15 to 30 minutes. They are heated either by gas, by steam coil, by hot air pipes or by both steam and hot air alternating in summer and winter. Equally simple is the process of ironing. No more heavy irons to wield, no more ironing boards. All the girl has to do is feed the linen to the roller of the ironing machine and the machine does the rest. The rollers are pressed together by means of springs arranged to yield to the varying thickness of the goods. The linen going through these rollers drops into the basket on the further side well ironed and ready for delivery. The machine shown in the illustration is a Pearl ironer, used principally in hotel and individual laundries. The Gem ironer, a smaller device of the same general construction, is used in private home laundries.

Drying Closet

Pearl Ironer

LONG DISTANCE SIGHT.

The strongest telescope in the world can bring the moon no nearer than an object viewed with the unaided eye would appear 250 miles distant. At 250 miles, a large mountain, if it were possible to secure a plane of that distance, would appear in very faint outline, but one could not discern houses, much less the forms of people.

Electrical experts are striving to discover some method by which we can see by means of electrical instruments, small objects at great distances. Think of being in New York and conversing with a person in San Francisco, and looking into his face as you carry on the conversation through four thousand miles of space. Yet this is really no more impossible than long distance telephony seemed twenty years ago, or wireless telegrams only ten years ago. It is sure to come, as the other seemingly impossible inventions have come, and in a little while we will scarcely give the matter any thought, for it will have ceased to cause surprise. How quickly we have accepted wireless telegraphy as an accomplished thing, and turn aside from it to look forward and ask "what next."

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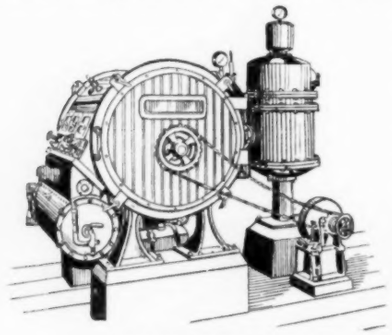
CONVERTS MILK INTO POWDER.

Invention That May Do Away with Sale of Product in Liquid Form

Soon you may have milk delivered to your home in a paper or cloth sack or in a package with a string around it. The grocer will scoop it up from a barrel like he does flour, meal or sugar. A new invention, called the exsiccator transforms skimmed milk into a highly soluble powder of flour, which can be tra sported for a long time without spoiling. The powder will readily dissolve in warm water, 60 to 70 degrees C., and



Milk Powder Machine

the solution tastes, smells and looks just like fresh milk. The invention comes from Sweden and is the product of the brain of one Martin Eckenberg. A large exsiccator will evaporate 521 gallons of skimmed milk in ten hours and costs about $1,200.

Popular Mechanics of Chicago is one of our most interesting exchanges. It is published weekly and the illustrations it contains are both numerous and excellent.—American Shipbuilder, New York.

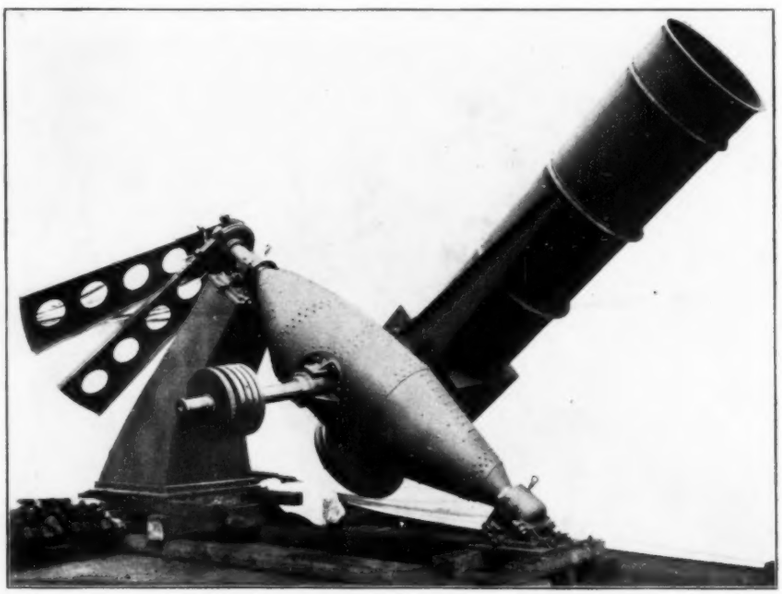
An irrigation enterprise costing $1,600,000 to be paid for by the Cecil Rhodes estate will reclaim 140,000 acres of land fronting on the Orange in the Colesberg district in South Africa.

Telescope That Follows Stars in Their Flight

New Reflector Being Installed in the Lick Observatory May Mark a New Era in Astronomy

By Dr. C. D. Perrine

[Editor's Note.—The new Crossley reflector, which will permit the observer to follow the stars in their flight through space, will soon be mounted and in working order at the great Lick observatory. Valuable additions to scientific knowledge are expected to result. The telescope was originally built by Dr. A. A. Common, a wealthy English astronomer. Later it was purchased by Edward Crossley, who, finding the English climate not well adapted to its use in that country, presented the telescope with its dome to the Lick observatory.]



Wonderful Reflector Being Installed in the Lick Observatory

The Crossley reflector is of peculiar interest, as it marks the beginning of improvement in reflectors which are leading to a more general adoption of this much neglected form of telescope. The present (original) mounting of the telescope is in many respects very well suited to visual observations, but very unsatisfactory in the field which has developed for the reflector; that is, photography.

The new mounting is of the equatorial form. The steel tube carrying the mirror and plate-holder is attached to a heavy steel declination axis. The declination axis passes through the central section of a long polar axis, which is supported at both ends. The polar axis is adjusted to exact parallelism with that of the earth, so that by rotating the telescope on this axis at the same rate and in the opposite direction a celestial object may be observed continuously for many hours. The declination axis permits of a motion of the telescope north or south.

The north end of the polar axis is supported by a leaning pier eight feet high, constructed of heavy steel plates, riveted to castings at the top and bottom, and strengthened by two angle-iron frames in the interior. A brick and concrete foundation six feet high will support the steel pier. The south bearing plate will rest directly upon a brick and concrete foundation.

The declination axis passes through the central section of the polar axis, which has been strengthened by being riveted to a heavy internal casting. The bearings for the declination axis are attached directly to this internal casting.

The tube of the telescope is eighteen feet long, and consists of a strong cubical section, which is attached directly to the declination axis, and of five circular sections. Below the cubical section is a circular section of heavy sheet steel, and to this is attached the cast-iron cell holding the mirror. The upper sections of the tube are of light sheet steel, bolted to steel rings. The last section is short, and can be rotated about the axis of the tube. In the center of this end section the apparatus for holding the photographic plate and for guiding during the exposure is held by four webs of steel. In a reflecting telescope the light from a star or other celestial body passes down through the telescope to a concave mirror placed at its lower end. The light is reflected back from the mirror and forms an image of the object in the focus, in this case seventeen feet six inches from the mirror.

Where the exposures are of several hours' duration the telescope cannot be trusted to follow the motion of the stars with sufficient exactness, no matter how accurate the mechanism may be. An auxiliary telescope is attached rigidly to the holder carrying the photographic plate. This guiding telescope is provided with a pair of very fine cross wires, and during the time that a photograph is being taken the image of a star is kept at the intersection of these cross wires.

The usual slow motions and clamps in both right ascension and declination are provided, as well as graduated circles for setting the telescope.

The thrust of the polar axis is taken directly on a ring of hardened steel balls at the lower end, and the greater portion of its weight by counterbalance rolls. The telescope tube, with the mirror and the various attached apparatus, is counterbalanced by adjustable weights on the opposite end of the declination axis.

WILL LIPTON'S YACHT DEFY DEFEAT?

Fortunes and Europe's Highest Mechanical Skill Lavished on the New Challenger

By Sir Thomas Lipton

"I christen you Shamrock III. May God bless you and may you bring back the America Cup."—Words of the Countess of Shaftesburg, as she broke a bottle of wine over the bow of Sir Thomas Lipton's splendid new challenger at the launching in the yards of Denny Bros., Dumbarton, on St. Patrick's day.

My third and perhaps my last attempt at lifting the American cup will be the most serious, and, I think, the most hopeful of my efforts. The Reliance may beat us, but it will not be because I have not got the best boat British brains and workmen can produce. However, a third defeat is, of course, quite out of the question.

I have every reason for the utmost gratification at the result of the trials at Clyde and off Weymouth. Shamrock did all that could be asked and more than was conservatively expected. The trials have proved the boat to be decidedly the best of the America cup challengers. In my opinion it is the fastest boat afloat in any kind of weather. If Shamrock III does not lift the America cup at the coming contest I doubt if it be possible for any nation to compete with American skill in yacht building.

Is the America cup which has remained with us so long in defiance of all challenges to be borne in triumph across the sea by the new yacht that is now delighting Europe's eyes at Weymouth? The acme of Europe's skill in designing and craftsmanship is embodied in the Shamrock III which is to be sent against the Reliance in the coming contest at New York. Money without limit and the combined efforts of the ablest yacht builders that Europe can boast have been lavished on the new challenger. The greatest ambition of Sir Lipton's life will be blighted if his boat should fail to win the next race. Never before in the history of the world has such money and pains been bestowed on a pleasure craft. Europe's yachting experts say the new Shamrock is invincible.

The launching of Sir Thomas' yacht was made an event of international importance. Two thousand shamrocks were distributed among the guests.

New ideas have been employed in the new challenger's construction that will undoubtedly make her a formidable opponent to the American boat. The hull is close to the 90-foot limit and the length over all is 138 feet, making it about 6 feet longer over all than Shamrock II. The beam is 22½ feet. The greatest breadth is aft of the main rigging. There is not much sheer in the deck plan. The rise forward is scarcely perceptible on a cursory glance, while the run aft is more palpable, though still not pronounced, and counter breaks off in a short cutoff at the rail instead of being fined away to a point. The draft will hardly exceed 19 feet 6 inches. The bulb holds about 95 tons of lead and differs from previous challengers in having a drop to the heel of about two feet.

That the British builders have learned something from the Americans is evidenced in the steering equipment. American wheel steering for the first time replaces the British tiller, and the lesson learned with Shamrock II through its pounding in head seas has led to a longer and finer drawn bow. The first appearance of the challenger under her spinnaker showed it to contain more cloth than any ever made before. It hoists 140 feet, is 78 feet across and is exceptionally full bellied.

To oppose this pride of Europe's artificers a modest appearing boat is now ready to be launched at Herreshoff's, Bristol, R. I. No search for skilled yacht builders was made in preparing for its construction; no fortunes have been expended in its building. But it was built in America; designed by an American; constructed by American artisans and is to defend the America cup—so England's yacht must look to its laurels.

The new defender is named the Reliance. To bring it good luck it is to be christened by Miss Nora Iselin, who christened the defender, which was launched Saturday, June 29, 1895, and who also christened the famous Columbia. She is the daugnter of C. Oliver Iselin and is now 17 years old.

A New York firm has constructed an automobile wagon for collecting bad debts, with its purpose painted in big letters on its sides. Imagine the sensation when this vehicle stops in front of a residence!

MILITARY BALLOONS AS WIRELESS TELEGRAPHY STATIONS.

Balloons will be generally used in future military operations as stations for working wireless telepraph systems. Such a means of communication would have been worth untold fortunes to the imprisonned citizens of Paris during the Franco-German war.

The German army is being equipped with portable outfits which can be hastily transported and put into service in the

Military Wireless Telegraph Station—Marching Order

shortest possible time. One illustration shows the entire equipment in marching order. The Electrical Review, London, ays:

"These stations consist of two vehicles. In the rear one is the transmitter, and the source of energy, consisting of a dynamo and a benzine motor. In the front of the carriage are the receiver, the reserve parts and various military accessories. These carriages are kept in readiness for working. The dynamo develops 2.5 kilowatts at 120 volts, 800 revolutions per minute. The benzine reservoir is under the carriage. On the right of the dynamo is the induction coil, which yields a spark of 40 centimeters. Above the dynamo is the condenser, consisting of 40 Leyden jars. The front of the carriage contains, on the right, the coherer and the relay. Beside them is the Morse registering apparatus. Under the carriage is the reservoir of hydrogen for inflating the balloons."

An exhibition drill is intensely interesting. At a signal the corps dash wildly away, pull up suddenly at the appointed spot, and all is activity. The horses are released, the carriges run apart. While one crew draws out the balloon and inflates it, the other is getting the electric plant started. In a few minutes the balloon rises rapidly in the air carrying the wires

Military Wireless Telegraph Station—Ready for Work

which are connected with the working instruments below. Anchor ropes prevent the loss of the balloon which can be drawn down at will.

A speed of 82 miles an hour for fifteen miles has been attained on the Midland Railway of England, with their new compound locomotives, with a 350-ton load.

The Greater Georgia Association has been organized at Anchor ropes prevent the loss of the balloon which can be vancement of the manufacturing and other interests of the states.

The Palmetto company of Philadelpnia has perfected machinery to shred the fibers of the scrub palmetto, hitherto without value, so that a perfect substitute for horsehair is the result.

Easy Electrical Experiments

By L. P. Dickinson

HOW TO MAKE AN ELECTRIC LOCOMOTIVE. II.

The motor for our model locomotive was described in a preceding chapter. This motor must be mounted on a suitable truck, the construction of which will now be described. A general view of the truck and motor is shown in the accompanying figure. The wheels shown at W are perferably turned from hard rubber, but may be turned from a piece of hard wood. The material required is ½ inch thick, the running face of the wheel being ¼ inch wide, the flange ⅛ inch and the small hub ⅛ inch thick. The diameter of the running face of the wheel is 1⅝ inches, the diameter of the flange is 2 inches and that of the hub is ⅜ inch. They are mounted upon shafts made of a piece of 5-32 inch brass or iron rod threaded at each end so as to screw tightly into the wheels. The total length of this shaft is 3½ inches, and the distance between the hubs of the two wheels is 2½ inches.

The front and rear axles of the truck are connected by two brass strips E and D which are 5 inches long, ¾ inch wide and ⅛ in thick.

The motor which was described in the previous chapter is mounted in the frame thus formed by screws passing through the brass strips and into the wooden block which is clamped between the limbs of the magnet. A similar arrangement of wooden blocks at the end of the magnet shown at M se-

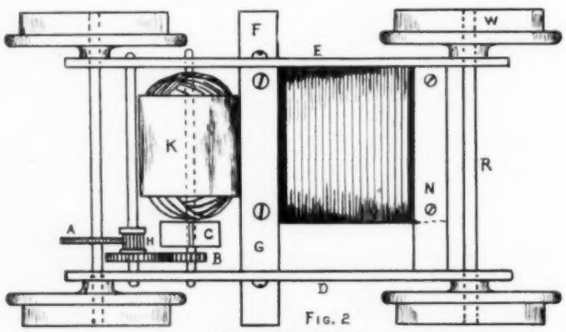


Fig. 2

Plan View of Truck

curely fastens the magnet in place. The long strip F should be on the lower side of the truck.

Connection is made between the armature and the front shaft by means of the train of gears indicated at A, H and B. These gears may be taken from an old brass clock, and since the size of the wheels used must necessarily be different in each case, the exact distance between the shafts supporting these gears cannot be given. The amateur will have to begin by first locating the gear A, then the shaft which carries the gear H, then the shaft which carries B and the armature of the motor, and the location of this last shaft will determine the location of the field magnet frame in the frame of the truck.

If the locomotive is to run on a straight track, the axles may be rigidly fixed as already described. If, however, it is run on a circular track, especially if the latter be of rather short radius, one of the axles will have to be so fixed that it may swing in one way or the other to allow the locomotive to go around the curves. The amateur can easily arrange this for himself.

The springs which convey the current into the armature are made of very thin spring copper or brass and are fastened to the wooden blocks so as to bear rather lightly upon the commutator C. They are omitted in the diagram for the sake of clearness. The armature and fields of the motor are connected in series, and the terminals of the motor are connected to two brass springs which are screwed on to the terminals of the wooden strip F, and are bent downward so as to bear upon the rails upon which the wheels are to run. The track may be made of strips of thin copper, cut into convenient length about 1 inch wide and bent over at right angles so as to form a suitable bearing surface for the wheels. The rails serve as conductors for the currents of electricity and must therefore be fastened to some non-conducting support such as wood.

The amateur may follow his own devices in the construction of the body of his model locomotive, the form shown in Fig. 3 being a model of some of the large locomotives now in use. If the reader possesses a scroll saw, he may cut the parts nec-

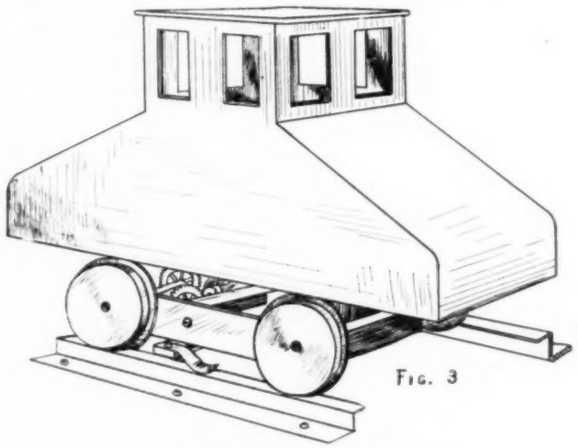


Fig. 3

Electric Locomotive Complete

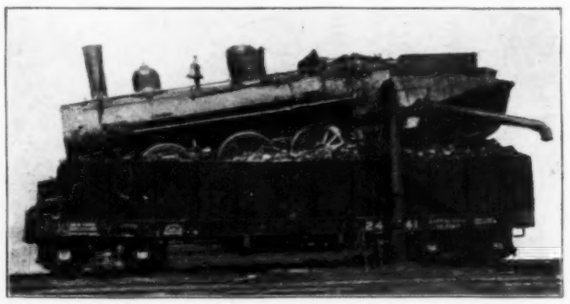
essary to construct his model from pieces of thin wood which may afterward be glued together, and painted black, presenting a very neat appearance. Four cells of bichromate battery ought to run the locomotive at a good rate of speed.

WOOD THAT OUTLASTS STEEL.

The Niagara Falls Power Company has contracted for 3,000,000 feet of California redwood, which is to be used for the construction of water conduits in place of steel. Experience shows that the sand and gravel which are carried in flood periods by the Niagara river rapidly scour and destroy steel, whereas the action of water on redwood is to form a surface of a soapy nature which protects the wood from destruction.

ENGINE THAT RODE IN A COAL CAR.

The switch engine was backing a string of box cars on the main line and was caught on the pilot of a fast mail engine hauling its train at 60 miles per hour, moving in the same direction, says the American Engineer. The switcher was handsomely lifted into the load of a coal car and only the



View of Wreck Showing Engine Riding in a Coal Car

pilot of the mail engine suffered. No one was hurt, and, if wrecks must occur, this is a good kind. The capacity of the car is 80,000 lbs. It carried 70,000 lbs. of coal and its overload of 137,000 lbs., to the shops, very comfortably, its proved capacity being 207,000 lbs.

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SHIPS THAT SAIL ON LAND.

Splendid Sport That is Just Now Becoming Popular in Various Parts of the Country

Sailing vessels on land are so simple of construction and easily operated that it is a wonder they have not been employed as pleasure vehicles for generations. It seems to have been but recently discovered, however, that a vessel can be made to sail on land where there are few obstructions almost as well as on the sea. Sailing land-vehicles are now used on the great deserts of California and New Mexico. The "Desert Queen", illustrated and described in Popular Mechanics, March 8, and the "Hobo", a land vessel made by two boys of Minden, Neb., described in the October 4 issue, give an idea of the increasing popularity of the splendid sport of sailing on land. Now the vehicles are becoming numerous at all the southern winter resorts. On the hard beach where there are no obstructions they go with the speed of the wind and with little effort on the part of the "pilot." They have lately made their appearance at Palm Beach, Fla., Coronado Beach, Cal., Daytona Beach, Cal., and at numerous other resorts. At Coronado Beach, four miles long, several who have become enthusiastic over the sport have attached sails to bicycles, thus relieving themselves of all physical efforts in propelling the wheel and attaining a speed that was never possible before. In any place where there is hard ground and few trees or houses the land ships work to splendid advantage. One of the largest and most successful that has recently come to notice was constructed by R. S. Trulock of El Reno, Okla., and is called "Go-Devil" because of the remarkable speed with which it sweeps along the country roads. Here is what Mr. Trulock says of his real prairie schooner:

"In building this craft, we took the wheels and axles of a light road wagon, making a platform out of two-by-fours 16 feet long and two feet wide, which we hung eight inches under the center of the axles, arranging the rear axle on a pivot, with which to steer the craft.

"Then we placed our four masts an equal distance apart, on the platform. Guying the masts with ropes to the sides of the platform and running out a bowsprit in front gives us five sails.

"We also arranged a brake on the front of the wheels, holding it off from the axle by means of springs. The brake is applied by a rope, which, when pulled, will check the machine if not under too great speed. I have found out, however, that in a very high wind this brake is of very little use. The only way to stop the machine is by drawing into the wind.

"The Go-Devil cost me altogether about $30, but we have

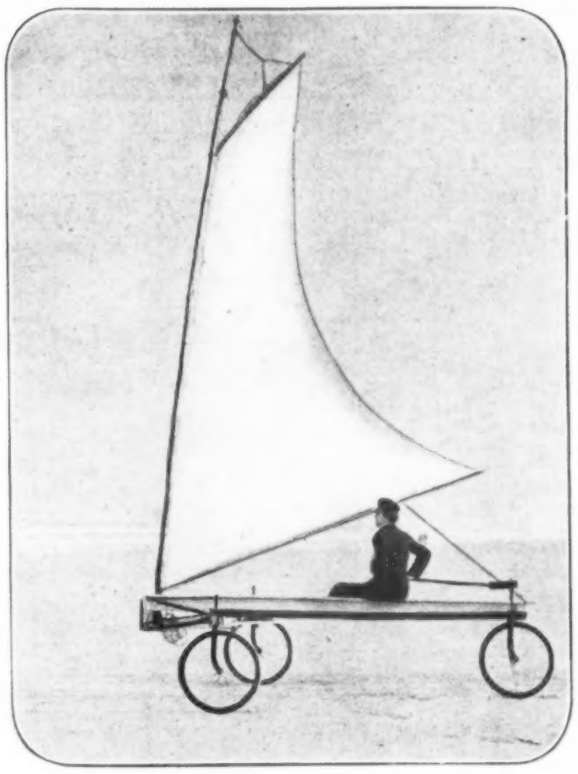
The Go-Devil of Oklahoma

had hundreds of dollars' worth of fun out of it. It is not practical in anything less than a 15-mile steady wind, such as blows in the prairie countries.

"At the moment I am designing a machine which will thoroughly eclipse the present one. It will be 35 feet long when completed, and will carry 500 feet of canvas, and will be designed for two persons."

CLAMS CAPTURE RATS.

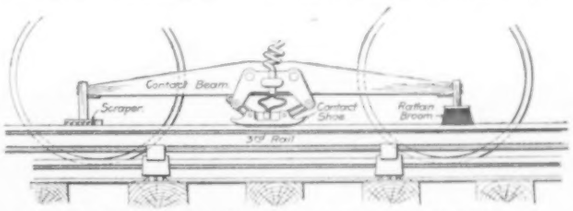
William Drafin, who conducts a market in Hoboken, N. J., has hit upon a new way of getting rid of rats. Recently he placed a basket of large clams in his cellar, and shortly after heard squealing sounds there. Investigation showed four rats held prisoners by as many clams. He is now thinking of having the idea patented.



Sailing on Land at Coronado Beach

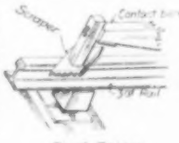
REMOVING SLEET FROM ELECTRIC THIRD RAIL.

The elevated and interurban electric roads which are using a third rail to connect the current instead of the overhead



Equipment for Cleaning Snow and Sleet from Third Rail

trolley wire, have suffered a great deal of delay when the rail became coated with ice or snow. The Street Railway Journal describes the plan adopted on a road running out of Detroit. The illustration fully explains the apparatus used.



Steel Cutter

"LANES" TO BE ESTABLISHED ON THE PACIFIC OCEAN.

An ocean is a strange place for streets and lanes, yet that is precisely what steamship companies are being asked to lay out on the Pacific ocean. As long ago as 1855 Captain R. B. Forbes of Boston conceived the idea and charts were made by Lieutenant Maury of the National Conservatory. These "lanes" are in use to-day and have been the means of greatly decreasing the danger of collision. The steamers bound for Europe take a more southerly course than on the return trip. It is now proposed to establish charted lanes on the Pacific.

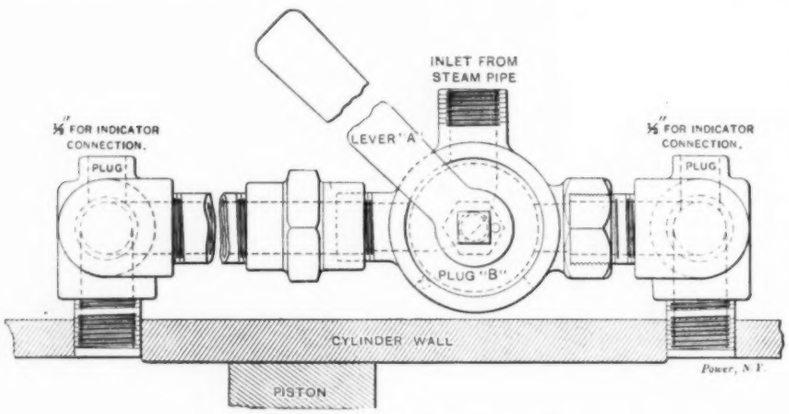
In case of shipwreck or accident the survivors endeavor to get their small boats as near one of these lanes as possible and are often picked up and saved by reason of these charted routes.

During the past year German shipyards turned out 227 steamers with an aggregate tonnage of 212,233 tons, and 280 sailing vessels of 58,715 tons.

SHOP NOTES

STOPS ENGINES OFF THE CENTER.

The pinch-bar and other methods of turning single valve engines off the center all have their objections. A method of preventing the crank from stopping on the center so that this trouble is entirely obliterated is described by J. C. Gaskill in Power.



Three-Way Cock and Its Application to Cylinder

The drawing shows a three way cock and its application to the cylinder which is piped in the same manner as the three-way for indicating, but the outlet (or inlet in this case) is piped to the steam supply above the throttle. The contributor says:

This device I have applied to a number of high speed belted and direct-connected engines, and find that with a 1¼ three-way cock and connections, after the throttle is closed and the engine is about to stop, the three-way may readily be operated and steam let into either side of the piston, thus preventing the crank from stopping on the center.

To apply the three-way I had the usual openings in the cylinder for the indicator connections redrilled and tapped or 1¼-inch pipe and used a 1¼-inch tee with ½-inch top outlet, which would permit the use of the standard pipe in all respects for indicating.

If the objection of increased clearance be raised, angle valves may be substituted for the ells at the ends of the pipe.

To accomplish the same result plug cocks may of course be used piped from the steam pipe direct to the ends of the cylinder, but in this case the operator many times would become confused in knowing which valve to open or close at the proper time.

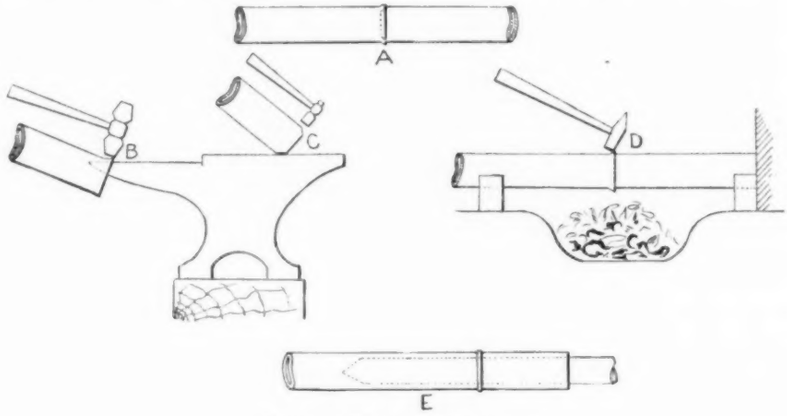
I find that with a 1¼-inch cock and connections a direct-connected engine of 400 horse power rated capacity may readily be stopped at, or run backward to, a point from which the engine may be started by the throttle.

It will be noted that the lever A is made so that it may be detached from the three-way after its use, so that at no time the plug B would be turned by accident while engine is in operation.

It will of course be understood that the more lap the exhaust valve has the smaller the three-way may be; but in cases above mentioned the valves were line and line with the ports; and a 1¼-inch three-way was found of sufficient size.

WELDING BOILER FLUES.

The welding of flues is a job requiring considerable skill. There are various ways of doing the work, one of which is recommended by a writer in the American Blacksmith, who says: The first step is as shown at B and C, using a four-ounce double-faced shoeing hammer. The flues are to be shaped in this manner so that they will go in about ½ inch, as shown at A. Then place the parts in the fire, being sure that it is clean and deep, and heat to a red. Then pull the pieces apart and insert borax. Push together again and add more borax. Have the helper blow all the time and keep turning the flue around and around until it is brought to a yellow heat. Then, with a light iron-handled hammer, weld the flue in the fire and smooth it up on the inside in the manner indicated in the figure. Finally take another welding heat and set it aside to anneal, and you have a good job.



Illustrated Hints on Welding Flues

Two million passengers are brought into New York City every week in the year.

GREAT CHANGE IN STANDARDS IN GREAT BRITAIN.

A radical change in standard sizes of structural and other irons and steel goes into effect this year in Great Britain. The change is necessary in order to compete with German and American manufacturers. The revision has been made under government direction by the most prominent manufacturers in the country, and the work of revision alone has cost $150,000. Within a year the government will insist on the new standard sizes in all work made for it. This allows several months in which to make new rolls or recut old ones. The change, when made, is expected to save nearly $4,000,000 a year in structural steel alone. The United States and German standards have been quite closely followed.

KEEP OIL FROM AUTO TIRES.

Great care should be taken to prevent oil or grease from coming in contact with the rubber tires of an automobile. A cent's worth of oil may do more damage to the expensive rubber tire than a hundred miles of travel. The Motor Age says: All fatty substances are detrimental, as they act as a solvent upon the rubber. This can be easily proved by rubbing vaseline upon a piece of an old tire. The vaseline will cause the rubber to become spongy, and when dry it will crumble, and can be rubbed into powder by the friction of the hand. It is accordingly important that pneumatic tires should be protected from grease. Care should be taken that no part of the moving mechanism of the car throws oil on to the tires. Extra inner tubes should be placed in rubber cases whenever they are likely to come in contact with oil cans, oily cloths or tools.

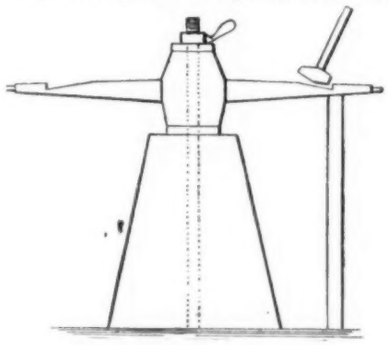
THE DUTCH ORIGINATED WINDOW SASH.

Sash are said to be of Dutch origin, though the date of the first ones made is not generally known. They were introduced into England in 1688, but did not come into general use for a long time, being considered a great luxury as late as 1710, says the Wood-Worker. From England they were passed into France and from there their use gradually spread until by the end of the century they were in general use in all countries.

REMOVING OLD SPOKES.

The discussion on how best to remove old spokes from the hub, is continued in the American Blacksmith for March. One suggestion is: Make a ring which will slip on the spoke easily and then drive a wedge between the ring and the spke. By hammering on the wedge the spoke may be easily removed.

Another method: To draw tight spokes which are not broken off, first bore a hole in the side of the spoke about 2½ or 3 inches from the hub. Take a rod of iron three feet long and large enough so that it will not bend, and insert it in the hole. Next take a piece of tire about 2½ or 3 inches long, ½ inch thick and 2 inches wide, place it against the hub and under the rod about one inch from the spoke. Then by prying on the rod, or using it for a lever, striking on the top and bottom of



To Remove Old Spokes

the spoke lightly, the latter will soon be loosened and can then be withdrawn.

Still another way is shown in the cut. Make a notch in the spoke with a saw and spoke shave, place a support under the spoke just outside the notch to prevent splitting, and drive it out as shown with great success.

TO PREVENT PAINT FROM PEELING OFF IRON.

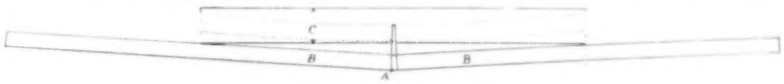
A method of preventing paint from detaching itself in large flakes from iron surfaces is described by the London Painter and Decorator as follows: First wash the surface to be painted with soap and water, rinse, and let dry. When dry, go over it with a stiff brush dipped in linseed oil. When this becomes "tacky" the paint can be applied. If the object is small and of such a nature that heating will not hurt it, raise the temperature until a drop of oil brought in contact with it "smokes." Go over the surface carefully with the raw oil and let cool. It is now ready to receive the paint. With large objects which cannot be heated, the main point is to apply the oil as hot as possible, the nearer to boiling the better. Objects thus painted will preserve the coat of color for an indefinite period, the paint being unaffected by heat or cold, excessive moisture or excessive dryness. Wood exposed to the weather may be treated with good results in the manner indicated.

In France the working hours for women and children have been reduced to 10 hours a day.

In Popular Mechanics want ads bring lots of answers.

LAYING OUT CURVES.

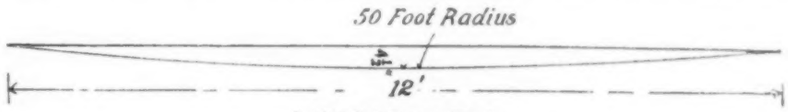
How to lay out large, true curves is something that I believe will interest most of the readers of this journal, says a writer in the Wood-Worker. I will try to explain a system I have used for a long time, and at the same time ask your readers to submit their methods. Every one who has had any experience in this kind of work knows that it is



Laying Out Curves, Fig. 1

next to impossible to obtain true lines to a radius of 50 feet or more by using a line, tapeline, wire or stick of that length, besides being obliged to go out of doors to lay it out on account of lack of room in the shop. The amount of curve on a board at a given radius—in one, say, 12 feet long—can be measured right from the plans sometimes but when the plan is not clear and neatly drawn, it is only a few minutes' work to lay it out to any convenient scale, as shown in Fig. 2.

After having determined how much curve is wanted, all that is further necessary is two straightedges as long as the board to be marked, as shown in Fig. 1, B B. These may be tacked on the floor, on a bench, or fastened to board by means of handscrews. If the curve amounts to 4½ inches, place the board C, about to be laid out, midway between the two straightedges. Of course, this board must be straight on one edge. Fasten straightedges down with exactly 4½ inches space from the board C. At the center, A, fasten pencil support high enough above board C to permit of its being pushed along under



Laying Out Curves, Fig. 2

it freely. All that is now necessary is to hold your pencil stationary in the little notches in A, push the board from one end to the other, and it will be marked perfectly true to any circle intended, as indicated by dotted lines on board C, keeping it up against B B firmly all the way.

ALCOHOL FROM THE ARTICHOKE.

Alcohol is being made from the Jerusalem artichoke in France. The artichoke in France is worth about $3 per 1,000 pounds. The culture of the root is analogous to that of the Irish potato. About 1,500 pounds of the tubers are planted to the acre. It is used when cooked as food for animals, especially for fattening cattle and hogs; horses are also fond of it. The distillation of the artichoke is analogous to that of the beet root. From 7 to 9 quarts of alcohol at 100 degrees are obtained from 220 pounds of tubers. The alcohol obtained is used for fuel and also makes good brandy.

The annual report of the inspector of the British army states that one subject which causes anxiety for the future as regards recruiting is the gradual deterioration of the physique of the working classes of England.

CASTING WITH OPEN RISERS.

It would be hard to explain the reason for some of the expedients resorted to by iron molders to ensure good castings. They do certain things because others have done them before, they are traditional, says the Mechanical Review, London, and to believe in them is part of their faith, which they seldom or ever think of questioning. One of the practices which belong to this orthodoxy is to keep the risers, or "flow gates," as they are called in Scotland, closed until the mold is filled with metal. Any reason we have ever obtained for this practice is that the incoming metal causes a great pressure within the mold, and this pressure prevents "scabbing." It is also stated that if the flow gates are open a strong current of air is set up towards the openings, and this is apt to displace small cores, chaplets, etc. We have often been skeptical of this theory, and have held to the opinion that if there were plenty of openings of large capacity there could be but little draught that would tend to disturb cores. We notice that a practical molder, writing in the "Foundry," is pretty much of the same opinion. He says he has made it a practice to keep all risers uncovered during the pouring of a mold, with the very best results, during the last eight years, and this applies to casting in loam, dry and green sand. He explains that when melted iron is brought into contact with a mold gases are formed, which, upon finding an outlet, burn with a blue flame. Every foundryman knows this, and if there are not sufficient means provided to convey these gases from the mold quickly, these gases will accumulate and make their presence known in no uncertain manner. And it seems reasonable to suppose that unless the gas gets away from the mold as quickly as it is made more or less of it will mix with the iron, and some of it will be retained in the casting as blow holes. Many foundrymen will say that the gases will easily find their way through the sand of the cope or whatever vents have been provided at the joints of the mold, or through a cinder bed, but Mr. Loudon contends that to get as perfect castings as possible these outlets are not sufficient. Open a riser when a casting is being poured and a flame 2 feet or 3 feet long shoots out. If the outlets otherwise provided were sufficient there would be no such display of flame. Put a piece of wood, or some other light substance, over a riser before commencing to pour, and usually it will be forced off long before the mold is filled, showing that considerable pressure exists within the mold, which should be relieved.

The only man who never makes a mistake is the man who never does anything. —Theodore Roosevelt.

BRITISH COAL OUTPUT.

The total output of coal in Great Britain last year amounted to 227,178,140 tons as compared with 219,037,240 tons of the previous year, an increase of 8,140,900 tons. The total number of persons employed in the mines of the 12 mine inspection districts was 825,401.

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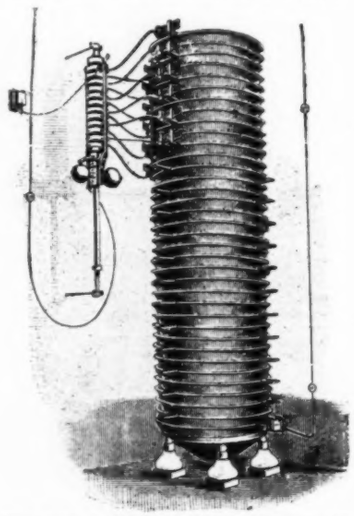
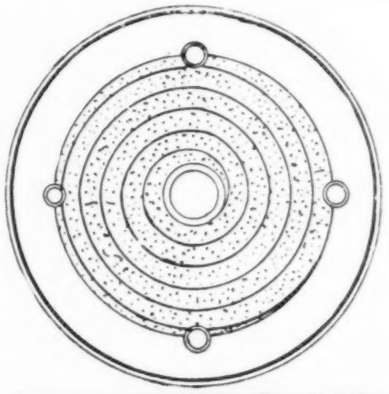
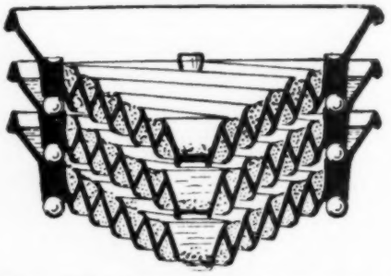
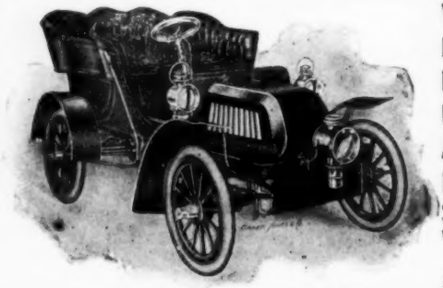
The Tribelhorn Storage Battery

The Tribelhorn storage battery is the invention of a German electrician and the Berlin scientific press is devoting considerable attention to the unique type. The cells are built one above another, the electrodes being made in the form of dish-plate-shaped and double-poled receptacles. A saving in space of over one-half is thus secured. The Wetsern Electrician says:


New German Storage Battery, Plates Assembled in Column

"Considering the dish-shaped plates (Figs. 1 and 2) it is to be understood that the inside represents the positive, and the outside the negative electrode. These plates are provided with grooves both on the outside and inside for the storing of the active material. The insulation of the plates from each other while building up the column is effected in the simplest way imaginable by the use of glass balls. The number of plates to be united in a column depends on their size. Of plates measuring from 28 to 32 inches in diameter, and weighing from 125 to 145 pounds, from 20 to 25 are usually taken. The column (Fig. 3) is mounted on wooden blocks in proportion to the number of ball-seats. The wooden blocks carry insulators made in two parts, which are provided with an oil-groove, and in their upper part there is a depression for the plug of a leaden support to be placed on top of them. The latter serves as a resting place for the glass balls carrying the lowest plate of the accumulator, whereon the other ones are to be piled, each supported by glass balls."



German Storage Battery, Showing Construction and Arrangement of Plates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1 very neat satin-finish petticoat.
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1 latest style seal-grain leather belt.
1 beautiful 1903 pattern silk tie.
1 genuine Irish linen lace handk'f.
Every article good honest value.
For $10 we send a complete man's outfit as follows:
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1 Derby, Fedora or Panama style hat.
1 pair latest style satin calf shoes.
1 pair Lisle-finish hose.
1 suit underwear, heavy or light weight.
1 latest style percale shirt.
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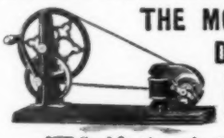

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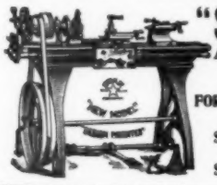

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There's a kind of happy feelin' creeps down in a feller when
He's got his punkins gathered and the haymow's full agen;
There's hope in all the breezes that come blowin' from the hill,
And you git to kind of thinkin' God is up there somewhere still.
What a purty sight the wheat is as it's plied up in the bin!
Oh, it's good to be a farmer when the crops are in!

It's lively in the city, and it's very quiet here;
There the hurry and the racket keep agoin' all the year;
There most every day's excitin', and they keep it up at night
Every way a person gazes there is some uncommon sight.
And I s'pose it's never lonesome livin' round the haunts of sin;
But the city people never have their crops all in.

There's many a day of toilin', and there's many an ache and pain,
And there's lots and lots of frettin' at the dryness or the rain,
There's the weeds and worms and insects that the farmer has to fight,
But the good Lord doesn't often fail to pull 'em through all right;
And the sweetest satisfaction that a mortal man can win,
Sort of hovers round the farmer when the crops are in.

—Farm Journal.

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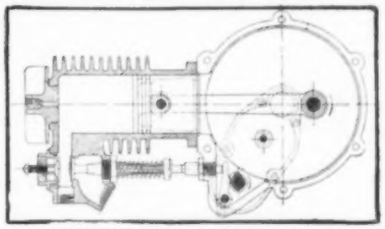

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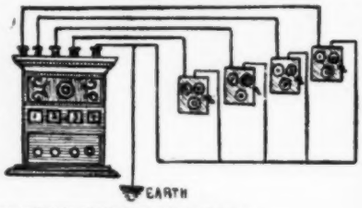

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LEGEND OF THE BOOMERANG.

Australian Ruler Obtained the Idea from Noting the Fall of the Leaf.

Editor Popular Mechanics: I have read with interest your article on boomerang throwing. Can you give me any information as to the origin of the boomerang? J. P. G.

Nothing definite is known of the origin of the boomerang. It has probably been used hundreds of years by the Australian natives. It is said that at one time an old king, or chief, was lying under a tree asleep. On waking he amused himself watching the leaves falling from the trees. He noticed that certain peculiar-shaped leaves instead of falling to the ground almost straight descended in circles, and from them he got the idea of the boomerang. It has always been supposed and generally accepted that no white man could ever become an expert with them until the recent achievement of an American, who has excelled the Australians.

The eccentricity of the boomerang can be determined only by the application of the most scientific principles, and yet the men who discovered this peculiar application of natural physics are of the lowest order of intelligence.

WHY WOOLEN GOODS SHRINK.

The shrinking, or felting, of woolen goods is caused by the felting quality of the woolen fibres, each of which is possessed of beard or slanting saw teeth, which favor forward movement but forbids retreat. Put a blade of grass in your mouth, move it and see which way it will go. Your tongue will give you the explanation, though your eyes may not be able to discover it. Moisture aids the woolen fiber to travel, by lubrication, as it were, and there must be some pushing or agitating force to set and keep it in motion. The washing of woolen underwear is the cause of much shrinking, because the conditions necessary to produce felting—moisture and motion—are supplied in the operation. In order to lessen the degree of felting, or shrinking, the time occupied in washing should be reduced to the minimum. It is essential to squeeze, rather than rub the garment, and to dry them afterwards as quickly as possible.

WHO THE "FISH SKINNERS" ARE.

The strike of the "fish-skinners" in Boston a short time ago caused many to ask: Who are the "fish-skinners?" "They are fishermen who skin fish," some of the all-wise have answered, and work amid slimy cold fish and cakes of scales covered ice." But that is not true. As a matter of fact the fish-skinner is not a fisherman at all; they do not work on the wharves amid the fresh fish. Not one person in a thousand has ever seen them at work. They work in dry rooms out of sight on dry fish. These men take the flat dried cod, pull off the skin and pull out the bones with their fingers and then cut up the meat into blocks, which are packed into boxes and bought under various names at the grocery stores from Eastport to San Francisco. The fish-skinners have a regular labor organization and earn from $12 to $25 a week.

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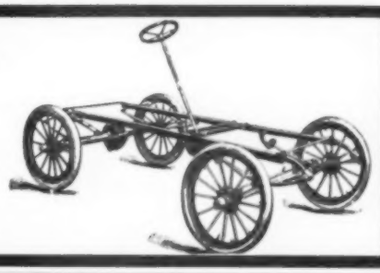

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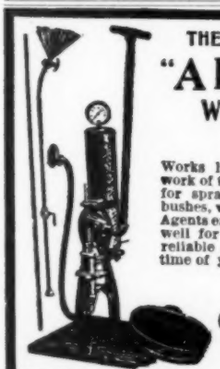

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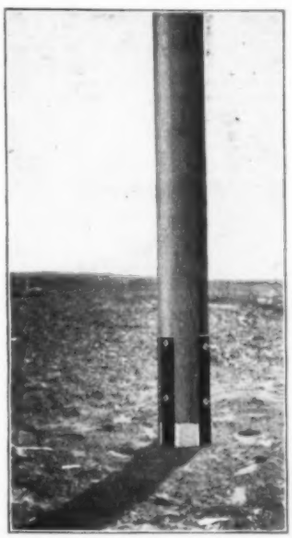
Prolongs Life of Telegraph Pole

Cement Rapidly Supplanting Wood in Railway Construction

Indications point to the abandonment of wood altogether in the construction of railway lines. The cement tie is rapidly supplanting the wooden tie, as told in previous issues of Popular Mechanics, and now foundations of telegraph poles are being made of cement as a means of preventing decay. It is only a question of time until the entire pole will be of cement. Thus it seems that cement is destined to be the successor of wood in railway construction as the latter material sinks into disuse from scarcity and inferiority. The cement foundations of telegraph poles are called cement butts. There is now a company—the Durable Cement Post Company—engaged in their exclusive manufacture. The butts are said to make the post last three times as long, and in the meantime the liability to accident from storms is greatly reduced. The constant burning of organic matter along the right of way of steam roads often almost severs the pole at the ground line. This and other causes of decay are met by the cement butts. The butts also serve to save old wooden poles that have become rotten under ground, by sawing off the rotting part and planting the upper part of the post on a firm cement foundation. They are used to make present lines higher by setting the cement butts beneath the poles. They have saved thousands of poles left to lie in yards as useless because of their being considered too short. In up-to-date construction, however, the poles are cut five feet shorter purposely and fastened to the cement butts which bring them to the necessary height.



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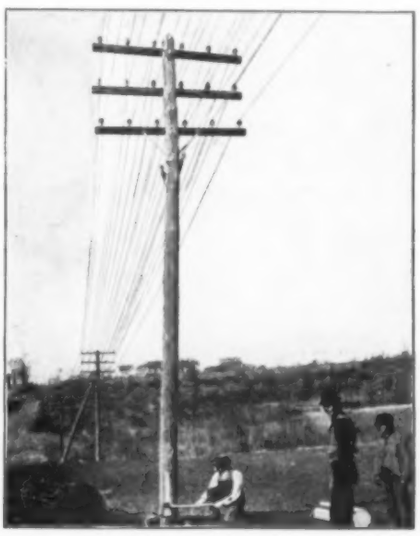

Old Line—Scoring Pole for Connection

HOW TO GET RID OF ANTS.

The Florist's Review tells how to get rid of ants, which infest greenhouses as well as other houses. Prepare a mixture of sixty grains corrosive chloride of mercury to one ounce of lard—thoroughly and completely mixing the ingredients. This will furnish a certain death to insects. In a greenhouse every post must have a circle of the poisonous grease, and every crevice between boards must have a narrow line of the poison. Ants cannot cross the grease and live.

A circle of the poisoned grease around the legs of a table or bench in a cellar infested with ants will be a complete protection to provisions stored there. Furniture and apartments treated in like manner can be readily cleared of bedbugs. Several applications may be necessary, but as long as the grease is visible the poison is active. Of course such an active poison will kill mice, cats or any creature that eats it. In mixing avoid getting on the hands, and do not leave any unused poison around where it may result in harm.

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